

MAR 24 1917

The Production Department

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THE GENERAL PROBLEM

The economic problem of the Production Department, expressed in a sentence, is to furnish daily the full quantity and quality of product called for, in all its required varieties, by the most efficient shop and labor arrangements, and with a minimum of fixed and cash capital locked up in the process. A production organization and a system of plan management which will accomplish this and continue to do so with harmony and satisfaction to employer and employee alike is the desired end.

The underlying practical motive of the seeker of efficiency in the Production Department is not indiscriminate speeding at the expense of the workers, but the securing by coöperation of the economies obtainable through either anticipating or locating and removing all wasted time and ineffective or unnecessary effort and expense, whether clerical, manual or mechanical. It is directed toward enabling employee and capitalist alike, under the most favorable conditions, to make the most of the opportunities of the working day, and in so doing a very large part of the usual burden is removed from the shoulders of the employee and placed upon the organization.

In a single brief paper it is impossible to discuss satisfactorily in detail the subject of production management, and I devote myself to outlining the most important factors.

THE DEPARTMENT SHOULD EVOLVE ITS OWN SYSTEM

Organization, though the primary factor in all business, implies coördination, or system, and not much can be accomplished without the aid of the latter.

Systems of production are necessarily as various in their details

Read at the first meeting of the Efficiency Society, held in New York City, March 18 and 19, 1912.

as the business conditions which have to be met. All attempts to fit a long-established business to the detail of a new system of outside origin should be discouraged. Such procedure is neither scientific nor sensible. The system should be evolved to suit the business. The task of prescribing for sick plants and ailing industries has in recent years become a recognized branch of engineering practice in which able practitioners are to be found among others with no serious pretensions to engineering training and no experience of the responsibilities of continuous plant management.

Some conception of the engineering accounting and costing and a conviction that certain methods of using tools and forms and of instructing and rewarding workmen cannot be improved upon, are not sufficient qualifications for attempting the reorganization of a business.

Where the attempt has been made to remodel the delicate mechanism of any concern on such limited intellectual and practical capital, the experiment has usually turned out a dismal failure. In some cases had less been attempted and the limitations of the proposed remedies and of their administrators been clearly perceived, results of some lasting value might have been attained. Extravagant claims and astonishing ignorance of human nature have put to rest not a few systems containing decided features of merit.

In order to get a glimpse of the forest, rather than of the individual trees, let us stand aside a little from the detail of plant administration and briefly survey the field. Consider first:

THE VARIETY OF MANAGEMENT PROBLEMS

The simplest conditions for which an organization and a system have to be provided are those of concerns manufacturing a thoroughly standardized product, which, under no circumstances, will they adapt or modify for special use.

As a business policy, this, of course, may be carried too far, and the product may be out of date before the fact is realized. In such a business, however, at one sweep many of the difficulties experienced by general engineering concerns are disposed of. Yet there remains ample scope for engineering and systematizing talent, and attention can be concentrated on a limited number of definite internal problems, the satisfactory solution of which may be obtained by gradual and experimental stages.

In plants in which standardization of product, a manufacturing basis of business, and reasonable frequency of improved design are

carried out, the shops and executive staff have few relations with the customer, and, with the exception of the supply of raw materials, their problems are purely internal.

The large number of plants engaged in the lighter, standardized machinery manufactures are embraced in this class. A comparison between their simple, rapid-flow, economical administrations and some of the complicated systems offered to-day for universal application is enlightening, and raises the issue as to whether we are not sometimes "paying too much for our whistle."

At the other end of the industrial scale we have the business in which a complication of agencies, some within and many outside the plant, must be skilfully tied up to each other with as little red tape as possible, if they are to produce the desired results within a given time.

In a class by themselves are problems of management, such as ship docking and repairing, and locomotive overhauling, where the time during which a large investment is earning nothing is the governing consideration.

Between the extremes cited, namely, where cost is the determining factor, on one hand, and speed of completion, on the other, there are all possible variations, no half-dozen of which could be most efficiently managed on precisely the same system.

AN ANALYSIS OF INDUSTRIES

The plants just given as typical economic examples, it will be noted, are embraced in the "Assembling" class of industries, a type which includes practically all the operations generally termed "Engineering." The outlook of the modern executive engineer is by no means confined to the above types of service, and a broader interpretation of the engineer's commission is obtaining.

Reduction processes of all kinds with ores, mineral earths, and other inorganic as well as organic substances furnish a great field for mechanical as well as administrative ability in what are known as the "Continuous Process" industries. In these the whole mass of the material to be operated upon is simultaneously under treatment.

Many of our largest chemical and metallurgical industries are examples of purely analytic problems in the arts which have increasingly used special machinery and mechanical appliances and now furnish additional tasks for the engineer in organization, system, and management.

Textiles, iron, and steel and many other continuous process industries furnish examples of synthetic businesses. These usually demand more organization and system than the analytic for efficient operation.

The product of the great assembling industries, however, where units have to be completely and elaborately finished on a large scale before assembly is possible, include the operation of our machine shops of every description and usually call for the highest skill of all in management and system.

THE ENGINEER IN SHOP MANAGEMENT

The demand for the services of the engineer in business organizations of all kinds, and particularly in industrial ventures, is of comparatively recent growth, yet it bids fair to be rapidly extended.

The control of the machine shops themselves by engineers has also been evolutionary in character. The last quarter of a century has been marked by the steady extension of the engineer's art, which now supports a large part of our modern civilization, and a similar development has been going on within the plants themselves.

During these twenty-five years the managing engineer and his staff have advanced from more or less subordination under the older systems, and merely clerical or commercial controllers, to no mean understanding of the once mysterious departments of accounting and costing. In other words, within almost two decades the engineer has become a bigger, broader man, and has been able to magnify his office.

In many plants, through the domination of the engineer in management, empirical rating of workmen and arbitrary treatment of labor in the shops have become things of the past. Possibly the extent to which this has been done is somewhat masked by the absence of publicity on the results of private endeavor, and the flood of theory on system which has occupied so much of the public attention.

The intensive application of the principles of production to-day owes much of its impetus to the arduous labors of the distinguished engineers, such as Fred W. Taylor and his associates, who have restated them in terms of modern industrial needs, and awakened great interest in the ultimate possibilities.

Before discussing the types of production systems in operation, let us consider briefly the principle that informs them all; *viz.*, the well-established doctrine of the division of labor.

To realize how slow engineers have been in promoting efficient administration of the human factors in industrial establishments, as compared with their zeal and success in furnishing material aids, a brief glance at economic history is necessary.

One hundred and thirty-six years ago—on the eve of the War of the Revolution—Adam Smith, the Scotch philosopher at the University of Glasgow, published his “Wealth of Nations,” and therein predicted the minute subdivision of manufacturing processes and handicrafts, and set forth its advantages.

Sixty years later the principle was firmly established in Great Britain, and Charles Babbage, a noted English mathematician and mechanician, described in 1834, in his “Economy of Machines and Manufactures,” the minute division of labor in repetition work actually obtaining in his day in various industries.

The methods were fully illustrated in the book, and its author also furnished a complete philosophy of the subject and examples of calculations as to the limits of reasonable investments in labor-saving machinery.

The synthetic industries forming continuous processes and dealing on a comparatively large scale with the necessities of life were the first to adopt the new principle, which evolved quite naturally with the dawn of modern industrialism. Textiles and other continuous processes in which machinery reigned supreme at a very early stage were the first to be affected by it.

It then spread rapidly to all simple forms of hardware manufacture where large quantities were manipulated. At the beginning of the twentieth century it was in its most refined form the basis of organization and system in all light machinery manufactures and in not a few other industries. Yet, until this time, the ordinary machine shops, which had greatly improved their tool equipment, had done very little to develop the possibilities of the principle among the human factors. These, very largely, were permitted to drift, to follow the division of labor naturally created by usurping machinery inventions, while the pure handicrafts, unaffected by mechanical engineering progress, were allowed to remain in much the same inefficiency as the art of Tubal Cain.

In our own day—three-quarters of a century after Babbage—we still find the division of labor with machinery carried much further than the division of hand tasks which he also advocated and described.

In many cases with us the unimproved "trade" is still the economic unit instead of the intensified "task." This is particularly the case in metal manufacturing and the building industries. Not only so, but labor has shown little disposition to improve the "trades," many of which are notoriously wasteful of time and effort.

Until quite recently it had not occurred to many engineers engaged in management, as distinguished from manufacturers pure and simple, to apply the intensive and task method of shop management thoroughly to anything except very light and very simple operations, and to not many of these.

There can be little doubt in these days when the high cost of living is a pressing problem that economic necessity, if not inclination, will finally drive us to take up in all seriousness the conservation and intensive application of human energies in every department of activity, distributive as well as productive, and that new avenues of usefulness will open up for the man who has thoroughly prepared himself by intellectual and practical discipline for the profession of the production engineer.

THE VARIETY OF SYSTEMS

We have glanced at the variety of administrative problems, and it is not my intention at present to go over in wearisome detail the variety of systems devised to meet these problems. These can be much better studied from the ample literature on the subject. I do wish at this time, however, to take a general view of the situation.

These systems are directed, as a whole, towards enabling the organization to attain the greatest productive accuracy, speed, machine capacity, and labor efficiency, the minimum consumption of material and supplies, and progressive improvement in all methods and apparatus.

Some of these systems practically ignore the organization, and, while professing to relieve the latter of its burdens, really create another organization strictly devoted to technical details, and often a source of conflict of authority and of loss to the business as a whole.

Others are not well considered systems of any kind, but merely preferred methods of handling details of accounts, of costing, of inventories, of labor instruction, labor reward, or machine operation, in which regard for the human factors is often conspicuous by its absence.

The systems in use fall more or less into the same two divisions as do the organizations of staff, "divisional" and "departmental."

So long as the plant unit or the engineering undertaking is small

enough for control by a thoroughly competent leader in advanced practice, with sub-officers or foremen equally well trained and suited for the close supervision of the number of men allotted to them, nothing, I believe, can excel in economy and dispatch the "divisional system" of operation.

THE MILITARY SYSTEM

The divisional system is sometimes termed, usually in an uncomplimentary sense, the "military" system. As a matter of fact, in the form in which it is frequently caricatured, the military system carried the load of our industrial arts for a century, and did it very well, too. It was no inherent fault of the system that the specific arts or trades were allowed to evolve without guidance or to remain stagnant.

Military systems to-day, which are supplemented by intelligence departments, can be pointed out in successful operation at much less cost than more highly elaborated systems.

The real difficulty with a well-organized military shop system is that of human limitations. The number of people who can be effectively supervised and instructed, and the number of things which can be planned for by any single individual reaches its limit as the plant unit grows, and the system begins to fall in efficiency thereafter.

THE FUNCTIONAL SYSTEM

Whenever the element of personal contact with the workman by supervising divisional officers ceases, the necessity for the smaller departmental unit-control arises. But this control is not necessarily one of the multiplied functional bosses.

In this connection some confusion at present exists, and it is supposed by many and positively asserted by some, that there is a particular economic virtue in pressing departmental systems into the extreme functional forms. Here, again, in actual practice we encounter human nature, and realize that shop management is an art rather than a science, and that it has to deal with too many unknown quantities and variables either to aspire to scientific rank or to adopt a fixed creed. There can be, and there have been, too many poorly coördinated bosses in functional systems of management.

In one production system the great division of labor in supervising functions which produced certain results in the operation of rough-cutting metals was carried over by analogy into the fruitful generaliza-

tion framed by Mr. Taylor, and made to do duty as an essential "element" in all his applications of the method which he has termed "scientific management."

Mr. Taylor's contention that all our efforts in system should be directed toward developing a "science" of each industry is perfectly sound and a proper ideal for every administrator, but the "elements" of the science of rough-cutting metals are not the essential "elements" of many other engineering operations, not to mention a host of industries awaiting intensive development by the engineer. Nothing but confusion and disappointment can come from assuming that they are, and endeavoring to mold all our industrial institutions after one pattern.

There is, in fact, no royal road to shop efficiency. The "principles" of "scientific management" have pointed in various hopeful directions, and, with picked men, have made some records, but they have not, in my opinion, satisfactorily solved the general human equation, nor have they produced "elements" which are capable of rigid application to anything except the narrow field in which these originated. But it is particularly with the effects, good or bad, of prolonged trial of the various systems on the human factors that the production manager is chiefly concerned.

The working "elements" of "scientific management" are accompanied invariably by an excessive amount of form work, recording apparatus, irresponsible clerical control, and expensive detail, which are quite unnecessary in the large class of repetition-work plants, and a source of annoyance and delay to staff and workmen alike.

Not only so, but nominally highly functionalized in supervision in order to fix responsibility, the "scientific" system actually fails to do this in practice. The degrees of authority are too finely divided for human relations, and they lead to friction, delays, and nonaccountability. In fact, the inside history of not a few attempts to install "scientific management," rather than efficiency measures appropriate to the problem in hand, shows that it needs an even greater genius to reconcile its practical difficulties than it does to run successfully the despised military system.

The latter naturally terminates and becomes inefficient with the growth of an institution—the period for changing to departmental control depending wholly on the caliber of the organization.

THE DEPARTMENTAL SYSTEM

The departmental system, on the other hand, as distinguished from the functional, lays no dogmatic rule upon industry. It has no quarrel with initiative and incentive. It does not seek their extinction, but their wise control.

Under a good organization to begin with, and aided by first-class intelligence and method-study divisions, for these elements are not peculiar to one particular system, it splits up the shops into units of control of reasonable size, supplies the best staff assistance, apparatus, material, and scientific instructions, leaves the head of each department full control within his sphere, and holds him solely responsible for increasingly efficient results. In getting these, he *may* functionalize more highly in some directions than in others, but he does so, not because of any *obligation* under an inflexible system to follow that course, but owing to the proved desirability of it. This is the true "scientific management"—management "according to knowledge" of the facts of the case, not according to theories previously framed to suit external facts.

THE ABUSE OF SYSTEM

"Scientific Management," so-called, is really a very big and difficult task. It has been outlined, not attained. It requires professional ability of the very highest order and heavy outlays. Stripped of the data, apparatus, and phraseology peculiar to it, which has led careless readers to regard it as a new way of running machinery, of paying men, of avoiding labor troubles, of insuring dividends, etc., it is neither more nor less in its essence than a bold, far-reaching proposal to revolutionize our industrial life. Viewed in that light, it is a brilliant, most interesting and suggestive speculation, based upon an immense amount of industry. Every engineer who wishes to be considered thoroughly educated should give it close study, and will be amply repaid.

To the shops, however, it presents itself, not as a theory, but in ready-made, complete, technical detail, a most expensive detail, and many businesses cannot contemplate the years of outlay which are frankly confessed as necessary before the promised returns will accrue, if at all.

It is necessary to bear constantly in mind that the ultimate measure of good engineering and production management is that which is satisfactory and makes the dollar go furthest.

Any system, however attractive and justifiable in some of its features, is, like the plant itself, worth no more than it can earn. No

manufacturer is in business as a subject for experimentation which may not point the way but merely warn others from following. All money and worry expended on system beyond the earning point is wasted.

An admitted experiment of measured duration and conclusive nature is one thing, but a shop revolution, confessedly covering years of transition experiences, is irretrievable, and usually unsupportable.

Dead uniformity and absence of scope in a system for individual initiative and incentive are not necessarily factors in securing what are the sole justifications for special outlay on system; *viz.*, absolute certainty of increased economy, accuracy, and dispatch.

In concerns in which system is an expensive hobby, rather than an economical tool, all kinds of extravagances will creep in, and will be justified by some philosophy which ignores common sense.

One of the claims brought before proprietors by some of the external practitioners of system is that it will not only render the efficiency of their business self-perpetuating—a most desirable end if attainable—but that it will also enable them to become, to a large extent, independent of their managers and higher executives. This is a somewhat mischievous doctrine, for questions are constantly arising in which no corps of clerks following written instructions can under any conceivable system take the place of the full use and recognition of able engineering administrators and their assistants.

The human element in the system, as well as in the organization, is half of the administrative problem, and there is a decided lack of elasticity in some of the shop systems offered for general application. The production manager has to hire in large numbers the average man, not the phenomenon, and he must often retain, instruct, and develop him. In so doing, he can follow no counsels of perfection but a system dictated by common sense and his own circumstances.

It is not a recommendation for any business system imported from the outside, but rather the reverse, that it should insist upon absolute conformity to type in details without regard to the particular problem in hand and the great amount of experience already acquired from it.

Some of the most practical modifiers of shop management are fully alive to this, but there is a tendency among the less wise to wield the new broom vigorously. It has been unfortunate, to say the least, that the cultural and practical qualifications for entering upon responsible efficiency engineering in the production department have been too low, and that the study of men and manners has been neglected in the devotion to method and means.

I believe that the best type of shop system is evolved, not from the outside, but in the shop itself, through careful analysis of its special business conditions and requirements by its responsible administrator, when thoroughly in sympathy with and experienced in advanced practice.

A busy and prosperous administration should always be on the lookout for betterment. It can sometimes be helped by system advice from the outside. It should never be controlled by it. The most natural tendency of the temporary outside adviser, with authority to change but without responsibility for current product and profit, is to stereotype the details of his previous limited experience, and so dry up the springs of initiative and suggestions within the plant.

The best productive system for any plant or engineering undertaking is that which will coördinate all the efforts of a good organization, and which will draw out and suitably reward the best effort of every one concerned—not forgetting the employer. The most suitable detail for so doing will never be exactly alike in any two cases, though the principles followed may be identical.

THE PROPER USE OF SYSTEM

In concluding the present topic, I state seven rules in regard to the efficiency of office and plant routine, which should be observed irrespective of the class of work done.

(1) Have a well-considered system of doing things, definite and business-like in all departments, not an imitation of something else, but one designed for your own use.

(2) See that a broad view of the subject is taken, and provision made for properly dovetailing the various departmental systems.

(3) Make the connection clear to all employees by the use of a chart. Such a table is self-interpreting, and saves much explanation.

(4) Have as little system and as few forms as possible. Make them a means, not an end. There are many daily items of shop practice being perpetuated in expensive card systems to-day, of which no use whatever is being made, or is ever likely to be made.

(5) Do not treat the system as a fetic. It is a good servant, but a bad master. So much of it as is justifiable is merely organized common sense. Prune and pare your system without stint, until it gives the utmost economy and dispatch.

(6) Do not fail to note closely what your system costs, and if it

is really paying its way. Very few can answer that question. With many it is purely a matter of faith.

(7) Be always on the outlook for improvements and suggestions from any responsible quarter, and discriminating in adopting them.

I believe in modern system in the Production Department. It should receive the hearty and discriminating support of all plant managers. The latter will increasingly be drawn from the ranks of those who have added to a thorough practical executive discipline in the shops, a full comprehension of what system can do, and also what it cannot accomplish.

The amount of modern system we need in our industries bids fair to amply justify itself by its efficiency, particularly in the lean years. The rest is dead-weight, and should go promptly overboard.

Discussion

THE CHAIRMAN: Mr. Calder refers to Adam Smith, who said that formerly one man could make 100 pins, pointing off the wire and polishing it and doing all the different stages in the process. After the division of the labor into many minute parts, one man cut off the wire, another made the end of the pin, another made it smooth, another put one end of it in shape and headed it up, and another pointed it, and then another polished it. The result was that the six could make more than 10,000 pins, each man's labor showing that twelve-fold or sixteen-fold accomplishment was done by the division of labor. I said when I saw that: "What would Adam Smith say if he saw these six or more men displaced, and he saw a machine that simply took in the wire at one end and turned out the pins at the other?" A large part of Mr. Calder's paper is devoted to functional management, and I will call on Mr. Gilbreth to say something about functional management.

MR. FRANK B. GILBRETH: The quotation that Mr. Kent made about the pins was written by Adam Smith, in 1776, in that book that we all studied, or ought to have studied, on an inquiry into the causes of the wealth of nations. I am not just sure where it is, it is some time since I read it, but I think it is in book 1, chapter 1, sentence 1, that he says that one of the great causes of loss in manufacture is having a man do two entirely different things. He does not say it that way, and that would be an exaggerated statement, but that is the idea.

You know that a horse, to make a record on the track, is driven

around the track three or four times just before he goes out to make the record. Not a day before, but immediately before. He is driven around several times, because those who know about horses say that about the third or fourth time around he goes fastest.

Those who have watched these records know that the highest output of a given kind of work is usually the third hour in the forenoon, and the second highest hour for the day is the third hour of the afternoon. That does not always hold true, but it does hold true in the vast majority of cases which I have heard of, taking this subject and talking about it, and examining the records of different men on the same kind of work.

Now, nearly everything in Adam Smith's book accepts this idea as a fact; Mr. Babbage, in 1831 or 1832, accepted it as a fact, and he wrote it so well that everybody accepts Babbage now. If all of us agreed that there is a distinct loss in output of a man working on a new type, then it would seem that it is a good proof of functionalization. If it is not so, that is not proof.

It would seem obvious, and requiring no proof, that everybody has a specialty. There are many men interested in a job, while it is being planned, who hate to do it after planning it. On the other hand, there are a good many men, who, if they were offered two jobs, one at \$5 a day to plan and execute, and the other at \$4 a day simply to execute, would turn the \$5 job down and rather have the \$4 job, and escape the responsibility for planning. That is another reason for believing that the greatest output will come from simplification of the work, so that a man can do the particular work he is best adapted to do.

Many psychologists have spent much time in demanding the selection of a worker for his job. That is a form of functionalization. That might be one of the first forms of functionalization—the determination and selection of the right workman for the right job. And so the experimental psychologist has spent a great deal of time in such selection and in the ability to memorize, which would give an idea of their ability to work in such a way. But all the psychologists, to the best of my information, lose sight of the fact that the man who is interested in a job and who wants to do it is, in the long run, the best man for that job, unless he is terribly handicapped by not being fitted for the job at all.

You can go down the line and see every reason under the sun for functionalizing the work. I know Mr. Calder, and have the highest opinion of him as an engineer and as a manager, but I do not agree with him when he does not approve of functionalization, which seems

to be a proved fact. I do not know why Mr. Calder does not believe in it, and it does not seem to me that he puts any proof forward to back up his statement that functionalization is not desirable.

Now, after separating the planning from the performance, and after picking the right man for the job, it would be the next thing to determine how long it would take him to do the work. If you take a man who desires to do the job, and who is especially fitted for the job, and then train him for the job, isn't it obviously a waste of time to try to prove that he is unfit for it, or not the best person for it?

Those opposed to functionalization jump up and say: "You make him narrow, and you take away his right to think; and if he wants a job anywhere else he is a round peg in a square hole."

Let us examine that statement in the light of Mr. Taylor's experience. As he has conferred with the brightest men everywhere, and has had the greatest experience and probably the greatest opportunity to conduct experiments, it would seem that Mr. Taylor's ideas on this subject should be very good. Mr. Taylor's scheme, which he approves of for the shop, is almost identical with the management of a baseball team. I do not know anything in scientific management, as approved by Mr. Taylor, which would be more apt as a means of comparison. Certainly no man would say that he would not want his boy in college to specialize for pitching because he would not be a good shortstop.

I have recently been seeing if we could improve the management of hospitals, and I find the doctors are satisfied to accept the management that applies in a manufacturing establishment, or in a brick mill, or a machine shop, and apply it in the hospital. This would rather upset Mr. Calder's seven principles, and particularly the first one; and it would seem that all the objections to functionalization are pretty well taken care of in the baseball team, not only taking in the nine players, but the umpire and the management and the man who sends them from town to town, and the man who takes care of the gate receipts, and so forth.

One thing I want to mention particularly is the initiative under the Taylor system. Mr. Calder says, or insinuates, that the initiative of the workman cannot be obtained under this scheme. As a matter of fact, it is obtained, and it is the only way to conserve all the good ideas of the workingman. The scientific managers do not run a debating society when they put in a new man. They ask the man to do the work in the standard way and in the standard time and standard quality before he makes any suggestion. After he has done that, then any suggestion he makes will probably be better. And the man-

agement is only too glad to confer with him and to give him a proper and fitting reward for his initiative and invention; and in that way we conserve all the best ideas of the best man.

THE CHAIRMAN: Mr. Porter has something to say on the subject.

MR. H. F. J. PORTER: From the contents of Mr. Calder's paper and the discussion which has been aroused by it, it seems to me that there is a misunderstanding in the minds of the people regarding the way that scientific management should be applied in our shops. When we look back into the history of scientific management, we see that it was formulated and developed by engineers largely through the analytical training which their minds had received in the technical schools. Therefore, as it has been introduced into shops it has been confined, in the main, to the Production Department with which engineers were familiar and not brought into the other departments; namely, the Financial, the Selling and the Cost-accounting Departments, with which they were not familiar. These latter departments require men with a different training to manage them. Sometimes shops do not have these four departments properly arranged, and in some of them one or the other does not even exist. Then they are like four-wheeled wagons with the wheels of different sizes or some missing altogether, and, when an engineer comes along and develops one and neglects the rest, conditions are not only not improved but made worse. Under such circumstances there is no scientific organization, and without it scientific management is impossible. For Organization and Management are the two attributes, one the form, the other the function of Government, and we must remember that the running of a shop involves the government of the men engaged in it.

Now how many men who have control of shops have studied the science of government so as to know anything about either organization or management?

Is it not possible, if not probable, that most of our shop troubles come from ignorance of these subjects on the part of those who should possess a knowledge of them, and yet where would they acquire that knowledge? There has been no place to acquire it until of late. Schools have recently been established for the purpose. That is one reason for the establishment of this Society, to collect and disseminate knowledge of such measures as will promote efficiency. The sciences of organization and management are among these measures, and that is why we have Symposiums on them at this first meeting.

THE CHAIRMAN: There is another society formed for the study of this matter, called the Scientific Management Society, organized a few



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months ago; and I was called to attend a meeting of that society two weeks ago and to make the first address made there.

That is formed from the scientific management experts, those actually engaged in doing things, and their object was to get together to compare notes. It is not a publication society for the purpose of educating the public, but simply to get together and discuss things that relate to their own performance; and I had to make an address on what the society might do. At the end of the address I said that the best thing to do is to get Mr. Taylor's statement, published in 1903, in the Proceedings of the American Society of Mechanical Engineers, and read it again. Read Mr. Taylor over again, and see what he says, and you will be surprised to find how thoroughly he covered this whole subject. Just read Mr. Taylor again, and see what he says about any phase of this question. I think Mr. Taylor will have more adherents the more his original paper is read. It is a masterpiece on the subject. Just as Adam Smith has been the best authority on political economy for the past one hundred years, just so is Taylor on scientific management for the next one hundred years.